

USB Extender Plus T/R Series

Twisted Pair Extenders for USB Peripherals



Safety Instructions

Safety Instructions • English

WARNING: This symbol, ⚠, when used on the product, is intended to alert the user of the presence of uninsulated dangerous voltage within the product's enclosure that may present a risk of electric shock.

ATTENTION: This symbol, ⚠, when used on the product, is intended to alert the user of important operating and maintenance (servicing) instructions in the literature provided with the equipment.

For information on safety guidelines, regulatory compliances, EMI/EMF compatibility, accessibility, and related topics, see the Extron Safety and Regulatory Compliance Guide, part number 68-290-01, on the Extron website, www.extron.com.

Instructions de sécurité • Français

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ATTENTION : Ce pictogramme, ⚠, lorsqu'il est utilisé sur le produit, signale à l'utilisateur des instructions d'utilisation ou de maintenance importantes qui se trouvent dans la documentation fournie avec le matériel.

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Sicherheitsanweisungen • Deutsch

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안전 지침 • 한국어

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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. The Class A limits provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference. This interference must be corrected at the expense of the user.

NOTES:

- This unit was tested with shielded I/O cables on the peripheral devices. Shielded cables must be used to ensure compliance with FCC emissions limits.
- For more information on safety guidelines, regulatory compliances, EMI/EMF compatibility, accessibility, and related topics, see the “**Extron Safety and Regulatory Compliance Guide**” on the Extron website.

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Conventions Used in this Guide

Notifications

The following notifications are used in this guide:

CAUTION: Risk of minor personal injury.

ATTENTION : Risque de blessure mineure.

ATTENTION:

- Risk of property damage.
- Risque de dommages matériels.

NOTE: A note draws attention to important information.

Software Commands

Commands are written in the fonts shown here:

```
^ARMerge Scene,,Op1 scene 1,1 ^B 51 ^W ^C  
[ 01 ] R 0004 00300 00400 00800 00600 [ 02 ] 35 [ 17 ] [ 03 ]
```

```
Esc [X1 * [X17 * [X20 * [X23 * [X21 CE ←
```

NOTE: For commands and examples of computer or device responses mentioned in this guide, the character “Ø” is used for the number zero and “O” is the capital letter “o.”

Computer responses and directory paths that do not have variables are written in the font shown here:

```
Reply from 2Ø8.132.18Ø.48: bytes=32 times=2ms TTL=32  
C:\Program Files\Extron
```

Variables are written in slanted form as shown here:

```
ping xxx.xxx.xxx.xxx -t  
SOH R Data STX Command ETB ETX
```

Selectable items, such as menu names, menu options, buttons, tabs, and field names are written in the font shown here:

From the **File** menu, select **New**.
Click the **OK** button.

Specifications Availability

Product specifications are available on the Extron website, www.extron.com.

Extron Glossary of Terms

A glossary of terms is available at <http://www.extron.com/technology/glossary.aspx>.

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Introduction

This section provides an overview of the *USB Extender Plus T/R Series User Guide* and the following products:

- USB Extender Plus T/R (rack-mountable)
- USB Extender Plus T/R HID Only
- USB Extender Plus T/R AAP
- USB Extender Plus T/R D

The following topics are discussed:

- [About this Guide](#)
- [About the USB Extender Plus T/R](#)
- [Features](#)

About this Guide

This user guide contains information to install, configure, and operate the Extron USB Extender Plus T/R Series transmitter and receiver pairs. Additional product information can be found on the Extron Electronics website at www.extron.com.

In this guide the term “extender” refers to either the transmitter or the receiver. Where differences exist between the transmitter and receiver, they are noted. Unless otherwise specified, the product name “USB Extender Plus T/R” refers to Extender Plus models.

About the USB Extender Plus T/R Series

The USB Extender Plus T/R extends signals over a single CATx twisted pair cable from USB peripheral devices that are located long distances from the host computer. It is compatible with USB 3.0, 2.0, 1.1, and 1.0 devices with high data transfer rates.

The transmitter connects directly to a USB port on a PC or USB host and includes USB peripheral emulation to enable trouble-free booting of a host computer that is not connected to a keyboard or mouse. The receiver features a built-in active four-port hub that supplies power to multiple attached USB devices.

The transmitters and receivers are available in three form factors that can be mixed and matched:

- **Rack mountable models** — The USB Extender Plus T/R models are 1 inch (2.5 cm) high, 6 inches (15 cm) deep, quarter rack wide and can be mounted to a rack or under furniture, or placed on a tabletop (see [Mounting the USB Extender Plus T/R](#) on page 25).

The **USB Extender Plus T/R Human Interface Device (HID)** models extend the usable distance of USB human interface peripheral devices. HID peripherals include standard keyboards, mice, hubs and other devices that do not require special USB device drivers. These models also support smart card readers.

The standard and the HID-only rack-mountable transmitters have identical enclosures and connectors, as do the receivers. The only visible difference between these two models is an “HID Only” label on the rear panels of the HID-only models.

- **Architectural Adapter Plate (AAP) model** — The USB Extender Plus AAP transmitter and receiver fit into a double-space AAP opening and is wall mountable. It can be mounted to a one-gang junction box if desired.
- **Decora model** — The USB Extender Plus D is a Decora®-style wallplate that fits into a one-gang junction box.

NOTE: The transmitter and receiver pair work with unshielded twisted pair (UTP) or shielded twisted pair (STP) cables. However, to ensure FCC Class A and CE compliance, STP cables are required.

Features

- **Long distance transmission** — Extends USB peripherals up to 330 feet (100 meters) on one CAT 5/5e/6/7 cable.
- **Supports USB 3.0, 2.0, 1.1, and 1.0 devices** — Supports bulk, control, interrupt, and isochronous transfers as defined by the USB specification.
- **Provides data transfer rates up to 480 Mbps** — Allows high speed transfer from thumb drives and other mass storage devices.
- **Integrated four-port hub** — The receiver has a four-port integrated USB hub, which provides 5 volts, 500 mA on each port. Allows simultaneous connection to multiple peripheral devices such as the Extron Annotator 300, mass storage devices, keyboards, mice, or other human interface devices (HID).
- **Peripheral emulation** — Offers increased system reliability by emulating a continuous connection between the host and an HID-compliant keyboard and mouse.
- **Real-time status LED indicators for troubleshooting and monitoring** — Front and rear panel LED indicators provide visual confirmation of port activity between an active host and each connected peripheral device.
- **Rack and furniture mountable** — Low-profile, 1-inch (2.5 cm) high, quarter rack wide metal enclosures enable the extenders to be installed discreetly, such as beneath a table or inside a lectern.
- **Included power supplies** — An energy-efficient, external, universal power supply, part number 70-775-01 (28-071-57LF), is provided with each unit. The power supply provides worldwide power compatibility with high demonstrated reliability and low power consumption.
- **Remote configuration and control** — The transmitter and receiver can be configured via Extron SIS (Simple Instruction Set) commands issued from the computer to the front panel 2.5 mm TRS Config port of the extenders.
- **Choice of rack-mountable and architectural form factors** — Available in a rack mountable metal enclosure, an dual AAP frame version, and a single-gang Decora-style wallplate for easy integration into a variety of environments.
- **Extends human interface devices** — The USB Extender Plus T/R HID-only models extend the usable distance of smart card readers and USB human interface peripheral devices that do not require special USB device drivers, including a standard keyboard, mouse, hub, and other devices.

Application Diagrams

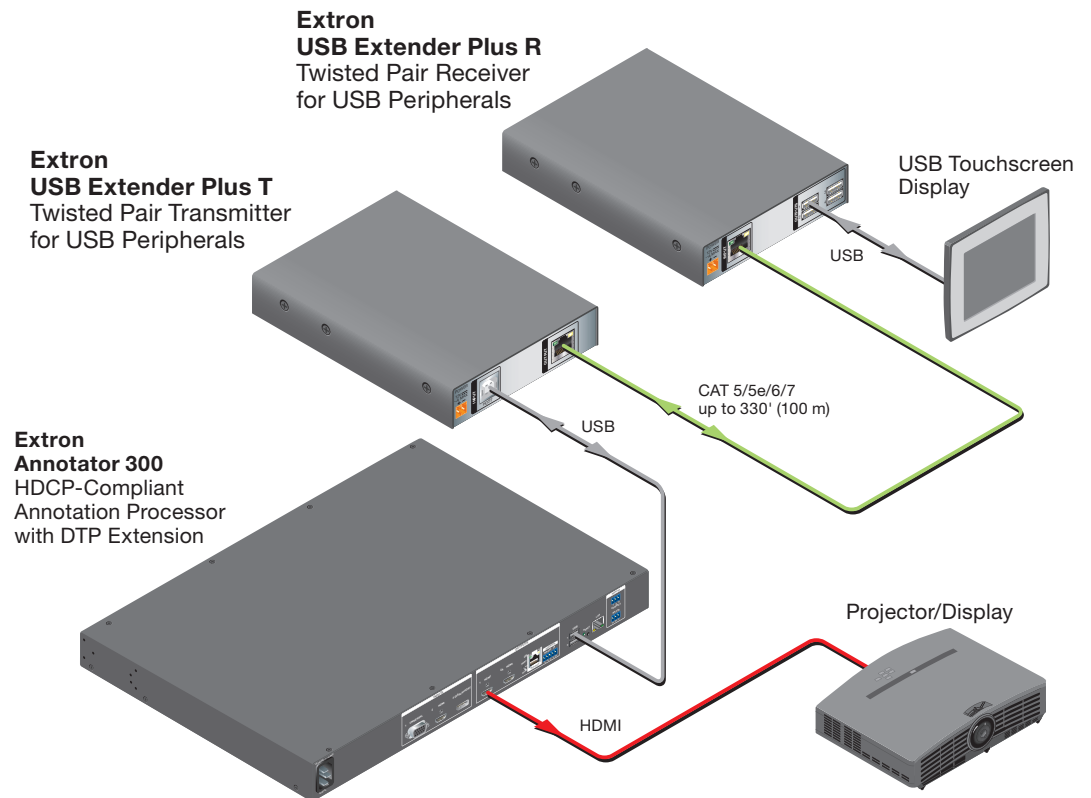


Figure 1. USB Extender Plus T/R Application with the Annotator 300

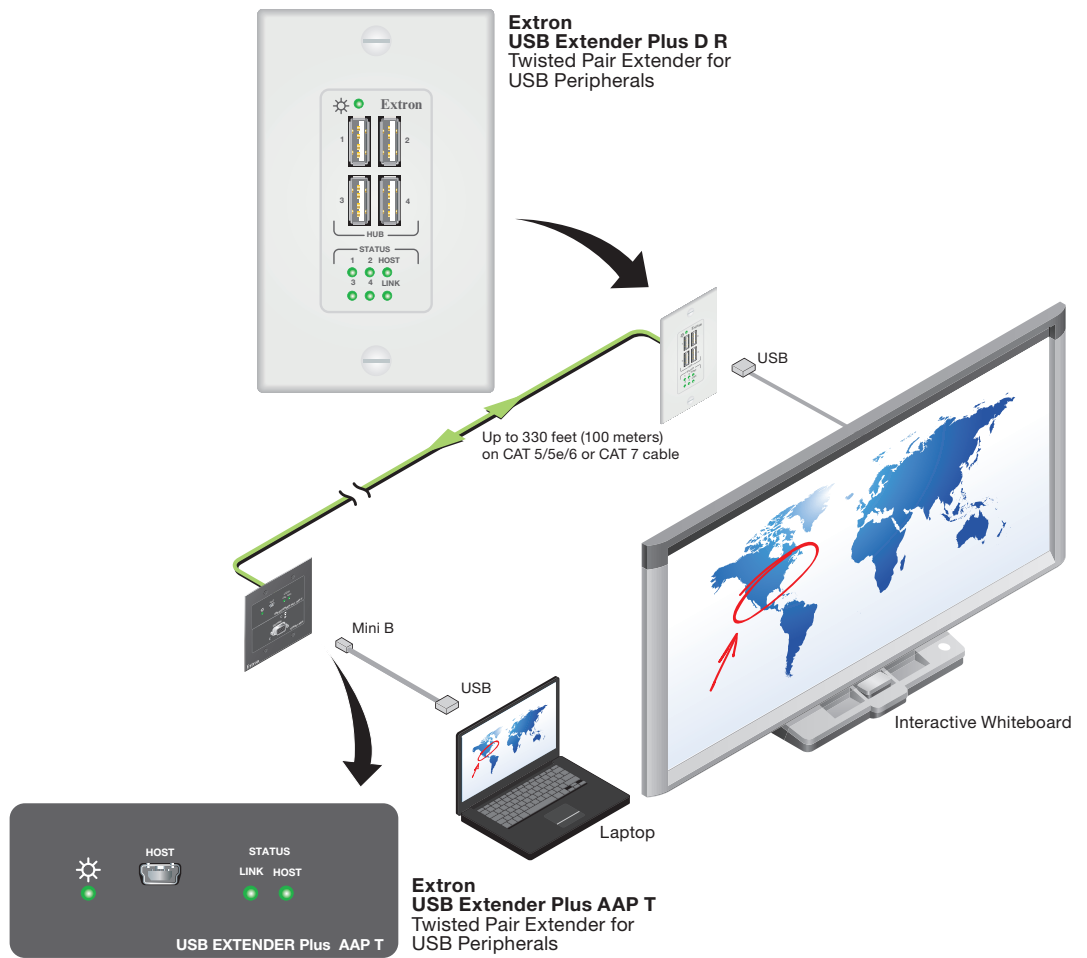


Figure 2. Application with Mixed USB Extenders Plus T/R, AAP and D Models

Installation and Operation

This section provides the following details:

- [Connection Guidelines](#)
- [Rear Panel Connections](#)
- [Cabling and Setup](#)
- [Front Panel Features](#)
- [System Operation](#)
- [Troubleshooting](#)

Connection Guidelines

The USB Extender Plus T/R can be installed in existing and new systems within the following guidelines:

- The USB Extender Plus cannot be cascaded (you cannot sequentially connect a USB Extender Plus T/R to another USB Extender Plus T/R or to a FOX T/R USB Extender Plus).
- The maximum number of USB hubs that can be connected downstream is four, when peripheral emulation is disabled, and three when it is enabled.
- The USB Extender Plus T/R is able to support a maximum of 31 downstream USB devices (including hubs). For example, if two 4-port USB hubs are connected to a receiver, that totals ten devices (two hub connections plus the eight hub ports).

Rear Panel Connections

Transmitter Rear Panels – USB Extender Plus T/R, Standard and HID-only



Figure 3. Transmitter Rear Panel Connectors (Rack Mountable Models)

Receiver Rear Panels — USB Extender Plus T/R, Standard and HID-only



- A** Power connector
- C** Input connector (twisted pair)
- D** USB hub connectors

Figure 4. Receiver Rear Panel Connectors

- A** **Power connector** — Connect a provided 12 VDC, 1 A max. external power supply to this 2-pole, 3.5 mm captive screw connector.

ATTENTION:

- Before connecting power, be sure to read the **power supply ATTENTION Notices** on page 9.
- Ne branchez pas de sources d'alimentation externes avant d'avoir lu les mises en garde sur la page 9.

- B** **Host (input) connector** — Connect a USB type A to B cable between this USB type B port and the USB port of a host computer. The USB Extender Plus T/R is USB 3.0 compliant and supports data transfers of 480 Mbps (high speed), 12 Mbps (full speed), and 1.5 Mbps (low speed).
- C** **Twisted pair connector** —

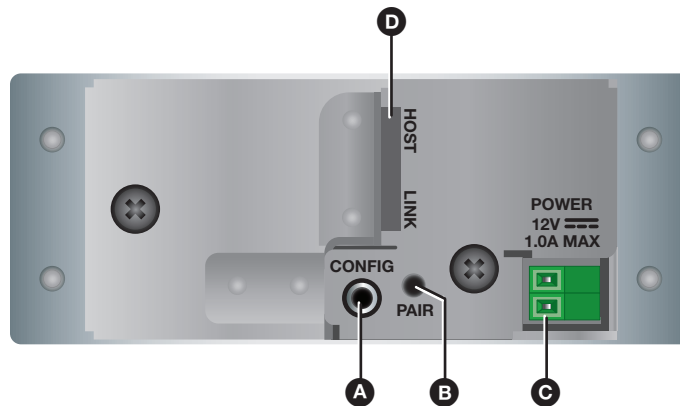
NOTE: On the **transmitters**, the RJ-45 connector is the **output** port.
On the **receivers**, the RJ-45 connector is the **input** port.

- **Transmitter** — Connect a TP cable from the RJ-45 Input connector of the receiver (see figure 4, **C**) to this female RJ-45 connector.
- **Receiver** — Connect a TP cable from the RJ-45 Output connector of the transmitter to this connector.

See **Twisted Pair Cable Termination** on page 24 to wire the RJ-45 connectors if necessary.

- D** **USB Hub connectors** — The built-in four port hub has four female USB Type A connectors. The connections are USB 3.0 compatible, providing +5 VDC at up to 500 mA to connected USB peripherals requiring power.

Transmitter and Receiver Rear Panels — USB Extender Plus T/R AAP and Decora



- A** Config port
- B** Pair button
- C** Power connector
- D** Twisted pair output connector

Figure 5. Rear Panel — USB Extender Plus T/R AAP Transmitter and Receiver

ATTENTION:

- The USB Extender Plus T/R AAP transmitter and USB Extender Plus T/R AAP receiver are to be used with UL Listed Extron products that accept Architectural Adapter Plates (AAP).
- L'émetteur USB Extender Plus T/R AAP et le récepteur USB Extender Plus T/R AAP doivent être utilisés avec des produits Extron conformes à la norme UL, qui prennent en charge des plaques d'adaptation architecturale (AAP).

NOTE: The rear panel of the USB Extender Plus T/R AAP receiver is identical to that of the transmitter except for the function of the RJ-45 connector. On the transmitter this connector is used for output, while on the receiver it is used for input.

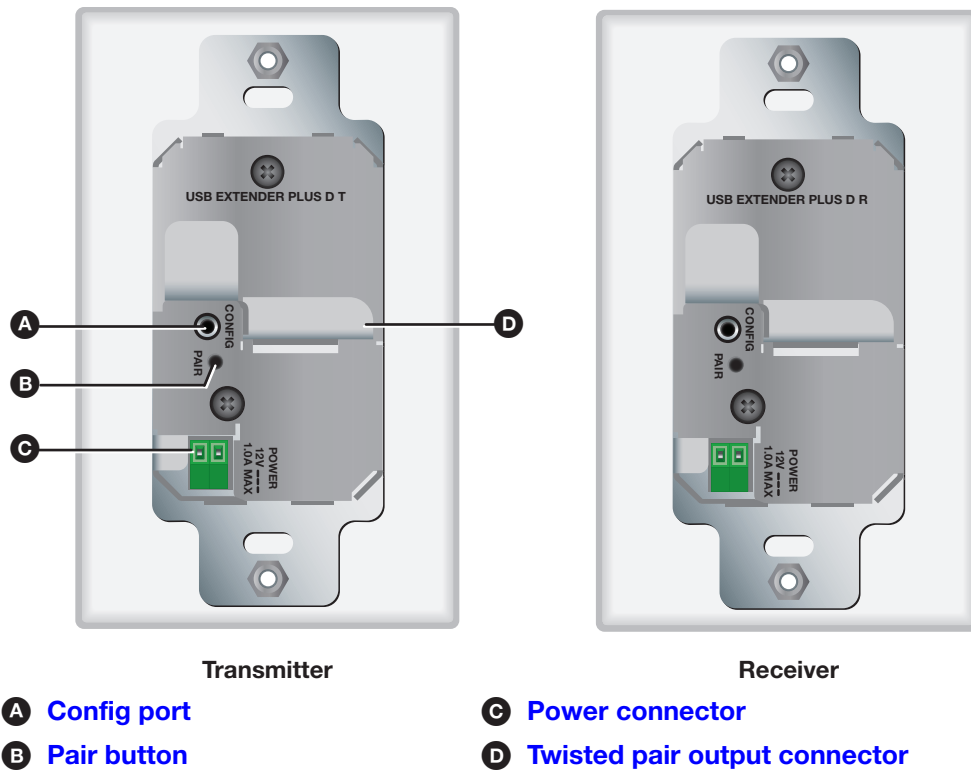


Figure 6. Rear Panel — USB Extender Plus T/R D Transmitter and Receiver

ATTENTION:

- The USB Extender Plus T/R Decora transmitter and USB Extender Plus TR Decora Receiver are to be installed in UL Listed outlets or junction boxes with the provided faceplate or a UL Listed faceplate.
- Installer dans une prise de courant ou un boîtier de raccordement certifié(e) UL avec le panneau avant fourni ou un panneau avant certifié UL.

- A** **Config port** — Connect a 9-pin D-to-2.5 mm TRS cable from a computer to this 2.5 mm TRS jack for RS-232 communication (see [Connecting for Serial Communication](#) on page 13). The Config port enables serial communication with the computer for configuration and control of the transmitter via SIS commands (see [Remote Configuration and Control](#), beginning on page 20).

NOTE: Because this connector is on the rear panel, you are not able to access it after the extender has been mounted. All communication via this port must be done before mounting.

- B** **Pair button** — This recessed button pairs the transmitter with the receiver, which must be done before operation the first time they are used together. Use a small screwdriver or stylus to press it (see [Pairing and Unpairing the Transmitter and Receiver](#) on page 12).

- C** **Power connector** — Connect a provided 12 VDC, 1 A max. external power supply to this 2-pole, 3.5 mm captive screw connector.

ATTENTION:

- Before connecting power, be sure to read the [Power Supply ATTENTION Notices](#) on page 9.
- Ne branchez pas de sources d'alimentation externes avant d'avoir lu les mises en garde sur la page 9.

D Twisted pair connector — Connect a TP cable between this RJ-45 connector and that of the other unit.

- On the **transmitters**, the RJ-45 connector is the **output** port.
- On the **receivers**, the RJ-45 connector is the **input** port.

See **Twisted Pair Cable Termination** on page 24 to wire the RJ-45 connectors if necessary.

Power Supply Attention Notices

The following notices apply to all USB Extender Plus models:

ATTENTION:

- The power supply must not be permanently fixed to the building structure or similar structures.
- La source d'alimentation ne devra pas être fixée de façon permanente à une structure de bâtiment ou à une structure similaire.
- Do not place the power supply within environmental air handling spaces or the wall cavity.
- Ne pas placer les sources d'alimentation dans une zone de traitement de l'air ni dans une cavité murale.
- The installation must be in accordance with the applicable provisions of the *National Electrical Code ANSI/NFPA 70, Article 725* and the *Canadian Electrical Code, Part 1, Section 16*.
- Cette installation doit toujours être en accord avec les mesures qui s'applique au National Electrical Code ANSI/NFPA 70, article 725, et au Canadian Electrical Code, partie 1, section 16.
- The power supply must be located within the same vicinity as the Extron AV processing equipment in an ordinary location, Pollution Degree 2, secured to a podium, a desk, or an equipment rack within a dedicated closet.
- La source d'alimentation doit être située à proximité de l'équipement audiovisuel Extron dans un emplacement habituel, avec un degré de pollution 2, fixée à une estrade, un bureau, ou dans une baie technique à l'intérieur d'un placard dédié.
- Always use a power supply specified by Extron for the USB Extender Plus. Use of an unauthorized power supply voids all regulatory compliance certification and may cause damage to the supply and the unit.
- Utilisez toujours une source d'alimentation fournie ou recommandée par Extron. L'utilisation d'une source d'alimentation non autorisée annule toute conformité réglementaire et peut endommager la source d'alimentation ainsi que le produit final.
- If not provided with a power supply, this product is intended to be supplied by a power source marked "Class 2" or "LPS" and rated at 12 VDC, minimum 1.0 A.
- Si ce produit ne dispose pas de sa propre source d'alimentation électrique, il doit être alimenté par une source d'alimentation de classe 2 ou LPS et paramétré à 12 V et 1.0 A minimum.

Cabling and Setup

Figure 7 shows connections for the USB Extenders Plus T/R, rack-mountable models. The connectors are the same for the AAP and Decora models except that the USB Hub connectors are on the receiver front panels and are accessible after wall mounting.

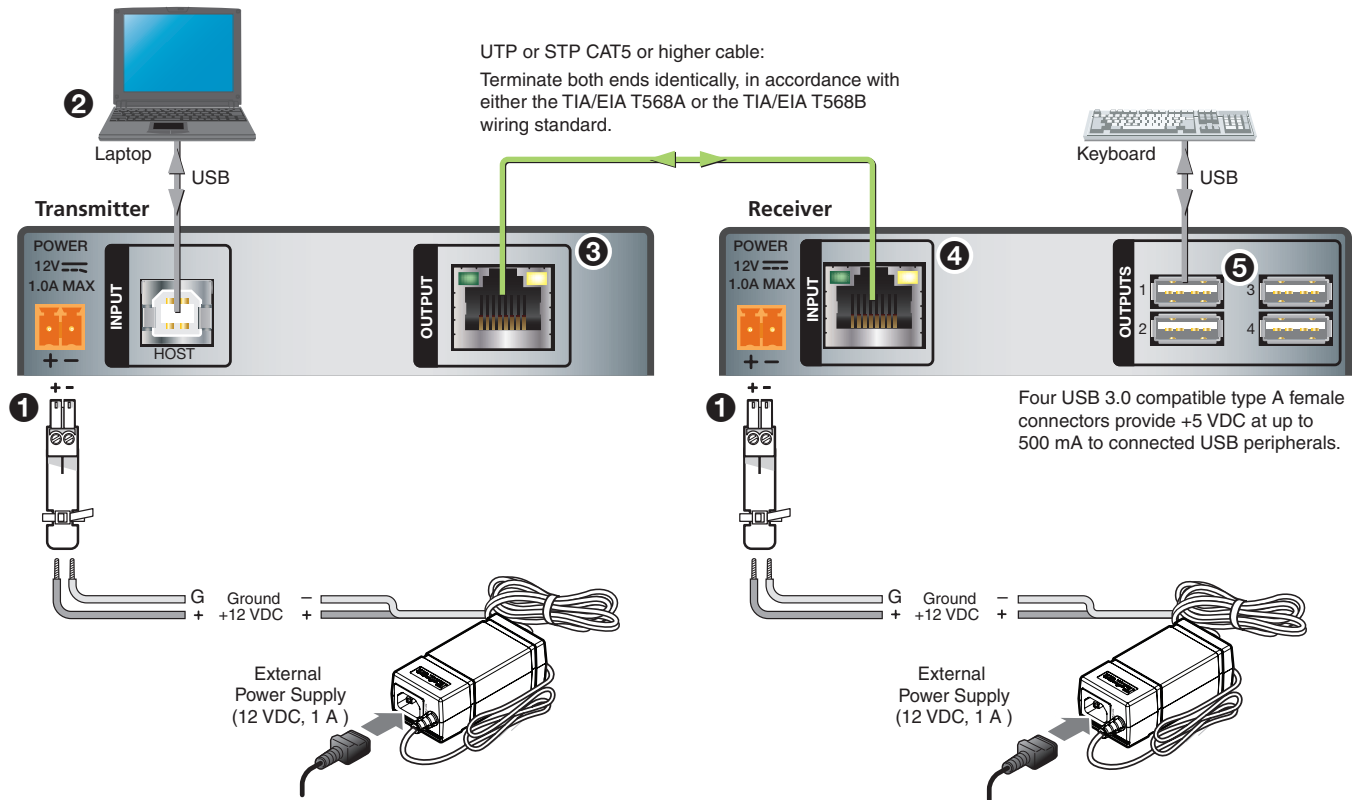


Figure 7. USB Extender Plus T-R Connection with Two External Power Supplies

Installation Procedure

ATTENTION:

- Installation and service must be performed by authorized personnel only.
- L'installation et l'entretien doivent être effectués par le personnel autorisé uniquement.

To ensure proper operation, the transmitter, receiver, USB host, and USB peripherals must be connected properly and in the sequence described here (see [figure 7](#) on the previous page).

1. Power off all devices that will be directly connected to the receiver.
2. Wire the two provided power supplies to the 2-pole captive screw connectors (see [figure 7, 1](#)) on the rear panels of the transmitter and of the receiver.
 - **Rack mountable models** — The USB Extender Plus T/R standard and HID Only models are provided with power supplies to which 2-pole captive screw plugs are wired. Plug these connectors into the rear panel captive screw connectors of the transmitter and receiver. If it is necessary to wire a power supply to its connector, see figure 8.

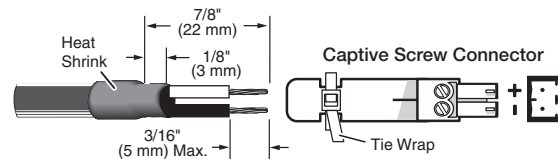


Figure 8. Wiring the Power Connector for the USB Extender Plus, Rack Mountable Models

- **AAP and Decora models** — These models have green insertion type 2-pole captive screw connectors on their rear panels. The power supply cables are terminated with bare wire. Insert the wires directly into the rear panel captive screw connector, as shown in figure 9.

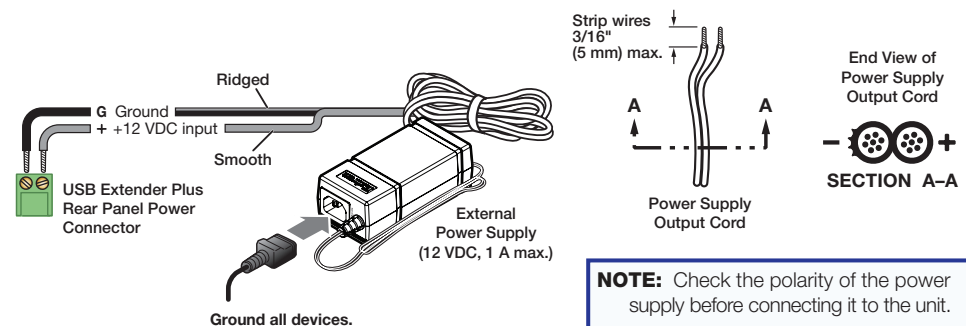
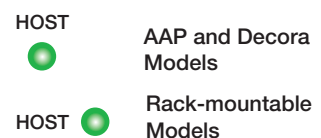


Figure 9. Wiring the Power Connectors for the AAP and Decora Models

The green power LED (shown at right) on the front panel of each extender lights.



3. Connect a USB Type A-B cable from a USB port of the host computer to the transmitter Host port (2). Shortly after, the receiver Host LED (shown at right) starts blinking, indicating that communication between the USB and host has been established.
4. Connect a CATx twisted pair cable from the RJ-45 Output port of the transmitter (3) to the Input port of the receiver (4).



5. Pair the transmitter with the receiver (see [Pairing and Unpairing the Transmitter and Receiver](#)). When the pairing process is complete, the Link LEDs on the front panels of the transmitter and receiver light (shown at right).
- LINK



AAP and Decora Models

LINK



Rack-mountable Models
6. If appropriate, choose a location and mount the transmitter and receiver (see [Mounting the USB Extender Plus T/R](#) on page 25).
 - **For rack mounting**, fasten the enclosure to the rack or rack shelf.
 - **For furniture mounting**, attach units to the mounting brackets (not included), then fasten the brackets to the furniture.
 - **For table mounting**, attached the provided four rubber feet to the bottom of the unit and place it where desired.
 - **For wall mounting (AAP and Decora models only)**, install the junction boxes, mud rings, mounting frames, or AAP frames, following the instructions provided by the manufacturer. Attach the units to the frames.
 7. Power on the host computer. On the transmitter, the Host LED on the front panel and the green Activity LED on the rear panel RJ-45 LAN connector light when the computer recognizes the transmitter. When the transmitter and receiver are paired with each other, the front panel Link LEDs light on both the transmitter and receiver.
 8. Connect up to four USB cables from peripheral devices (such as a keyboard, mouse, scanner, or printer) to the receiver Hub ports. When the first device is connected, the Host LED stops blinking and remains lit steadily.
As each peripheral device is connected, the LED for its hub port lights when the host PC detects the device.
 9. If desired, connect a 9-pin D-to-2.5 mm TRS cable between a computer and the front panel Config port on the transmitter, receiver, or both to configure the units via SIS commands (see [Connecting for Serial Communication](#) on page 13).

The system is now ready to operate.

Pairing and Unpairing the Transmitter and Receiver

In order to function together, the transmitter and receiver must be paired the first time they are used together. Both units must be connected together through their RJ-45 connectors (the transmitter Output connector and the receiver Input connector) and powered on.

NOTE: Before pairing a transmitter to a receiver, Extron recommends that you **unpair and cycle power to** each unit in order to clear any previous pairing or to resolve any pairing issues that might occur (see “Unpairing the transmitter and receiver”).

Unpairing the transmitter and receiver

To unpair a transmitter and receiver that have been paired together:

1. Press and hold the **Pair** button on either the transmitter or receiver until the transmitter Link LED turns off and the Link LED on the receiver begins to blink (approximately 10 seconds).
2. Release the **Pair** button.
3. Proceed with pairing the units (see [Pairing the transmitter and receiver](#) on the next page).

Pairing the transmitter and receiver

You can initiate pairing from either the transmitter or the receiver (the procedure described below is for transmitter-to-receiver pairing). To pair the transmitter and receiver:

1. Using a stylus or small screwdriver, press the recessed **Pair** button on the transmitter front panel and hold it for 1 second. The front panel Link LED on the transmitter begins blinking as pairing is initiated.
2. Within 10 minutes of pressing the transmitter **Pair** button, press the receiver **Pair** button and hold it for 1 second. The receiver front panel Link LED begins to blink.

When the LEDs of both units have stopped blinking and remain lit steadily, the pairing is complete.

NOTES:

- After they have been paired, the transmitter and receiver can be powered down and disconnected from each other.
- A transmitter and receiver need to be paired only once (at startup). If the paired units are reconnected and powered on, they do not have to be paired again.
- For the AAP and Decora models, be sure to perform this procedure **before** mounting the units.

Canceling pairing

To stop the pairing process before it completes, do either of the following:

- Do not perform step 2 of the pairing process described above (that is, do not press the **Pair** button within 10 minutes).
- Press the transmitter **Pair** button and hold it for 1 second. The Link LED turns off.

Connecting for Serial Communication

The Config ports on both the transmitter and the receiver enable communication with a computer via an RS-232 connection.

NOTE: On the rack-mountable models (USB Extender Plus T/R standard and HID-only), the Config port is on the **front** panel and easily accessible.

On the AAP and Decora models, the Config port is on the **rear** panel, so that it is not available after the unit is mounted. Any configuration via this port must be done before the product is mounted.

To enable serial communication, connect a 9-pin D-to-2.5 mm cable (not included) from the computer serial port to the Config port on the transmitter or receiver. You can enter SIS commands at the computer and issue them to the transmitter or receiver to control and configure the unit. The port protocol is 9600 baud, 8 data bits, 1 stop bit, and no parity.

An optional 9-pin D-to-2.5 mm TRS configuration cable is available from www.extron.com and can be used to connect your computer to this port. Figure 10 shows the configuration and pin assignments of this cable.

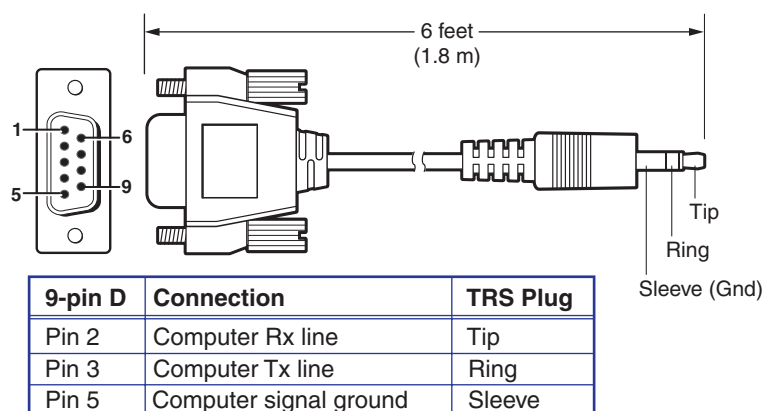


Figure 10. Optional 9-pin D to 2.5 mm TRS Cable for the Config Port

Enabling and Disabling Peripheral Emulation

The transmitter can be set up to emulate a mouse and keyboard to the host computer that is connected to the transmitter Host input port. This allows the computer to boot up in the event that it requires a USB keyboard or mouse to be present.

When peripheral emulation is **disabled**, up to **three** USB hubs can be connected in a series to the receiver. When peripheral emulation is **enabled**, up to **two** hubs can be connected.

Using SIS commands, you can disable and enable peripheral emulation. By default, peripheral emulation is enabled.

The following peripheral emulation commands can be issued to the **transmitter only**:

- **To disable:** `[Esc] E 0 USBC←`
- **To enable:** `[Esc] E 1 USBC←`

See [Remote Configuration and Control](#), beginning on page 20, for information on entering SIS commands.

NOTE: A USB extender with peripheral emulation enabled has a total of three hubs internally (two hubs with peripheral emulation disabled). Additional hubs may be on the host PC.

Front Panel Features

Transmitter Front Panels

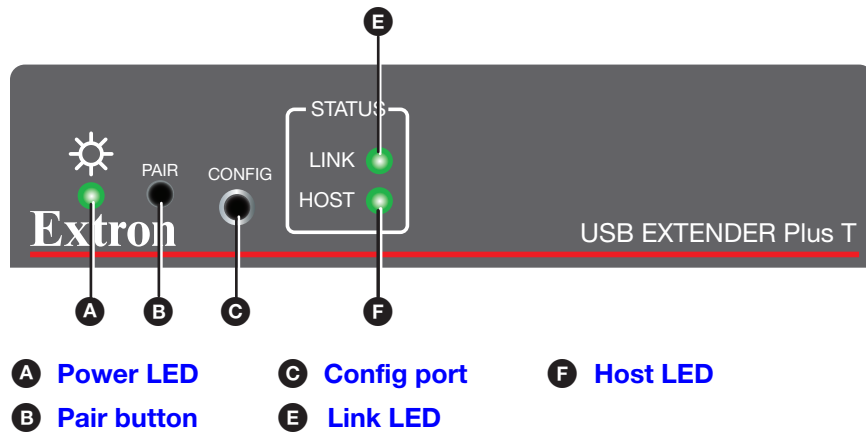


Figure 11. Transmitter Front Panel, Rack-mountable Models

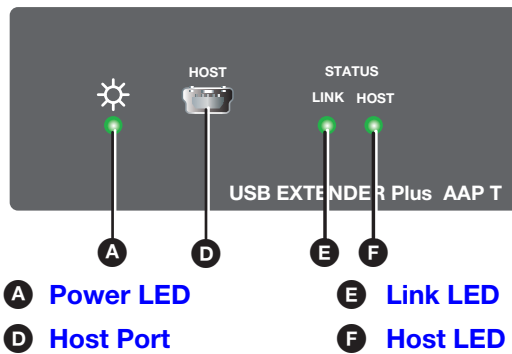
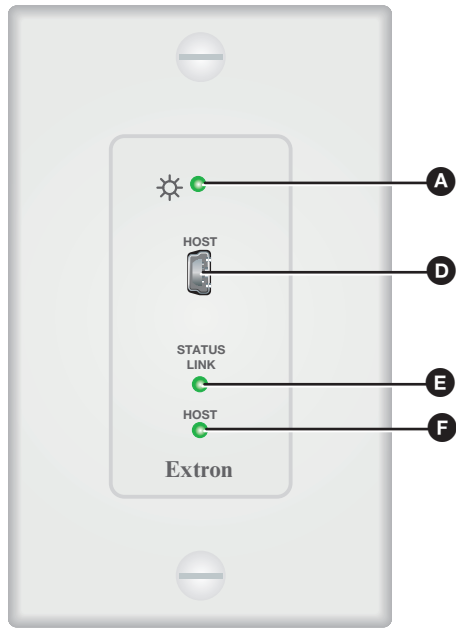


Figure 12. Transmitter Front Panel, AAP Model



- A Power LED**
- D Host port**
- E Link LED**
- F Host LED**

Figure 13. Transmitter Front Panel, D Model

- A Power LED** — This green LED lights to indicate that the unit is receiving power.
- B Pair button** — This recessed button pairs the transmitter with the receiver, which must be done before operation the first time they are used together. Use a small screwdriver or stylus to press it (see [Pairing and Unpairing the Transmitter and Receiver](#) on page 12).
- C Config port** — (Rack-mountable models only) Connect a 9-pin D-to-2.5 mm TRS cable from a computer to this 2.5 mm TRS jack for RS-232 communication (see [Connecting for Serial Communication](#) on page 13). The Config port enables serial communication with the computer for configuration and control of the transmitter via SIS commands (see [Remote Configuration and Control](#), beginning on page 20).
- D Host (input) port** — (AAP and D models only) Connect a USB type A to mini B cable from a computer USB port to this USB mini B connector. The USB Extender Plus T/R is USB 3.0 compliant and supports data transfers of 480 Mbps (high speed), 12 Mbps (full speed), and 1.5 Mbps (low speed).
- E Link LED** — This green LED lights when the transmitter and receiver are successfully paired, connected together by the twisted pair cabling, and receiving power.
While the transmitter is being paired with the receiver, this LED blinks. When the pairing process is completed, the LED lights steadily.
- F Host LED** — This green LED lights when the transmitter is powered and is communicating with the host PC.

Receiver Front Panels

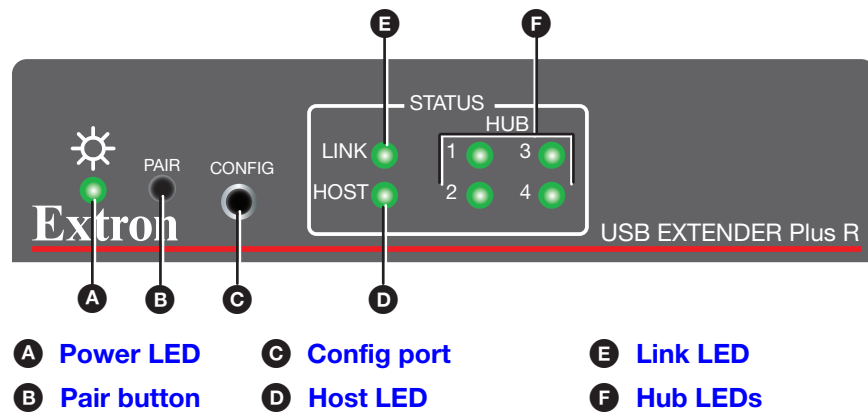


Figure 14. Receiver Front Panel, Rack-mountable Models

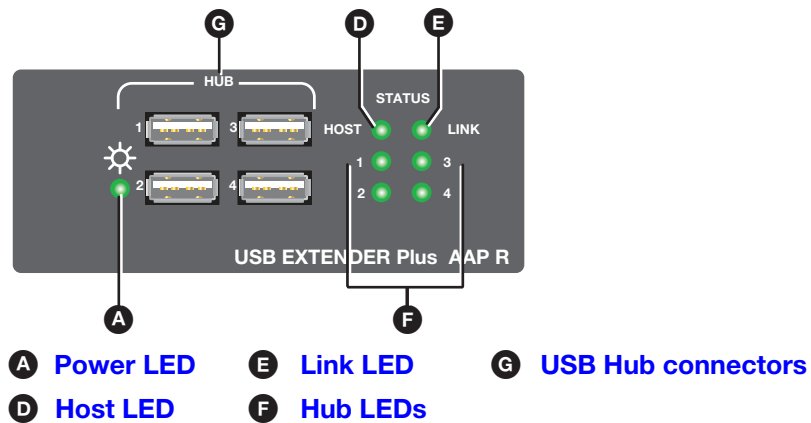


Figure 15. Receiver Front Panel, AAP models

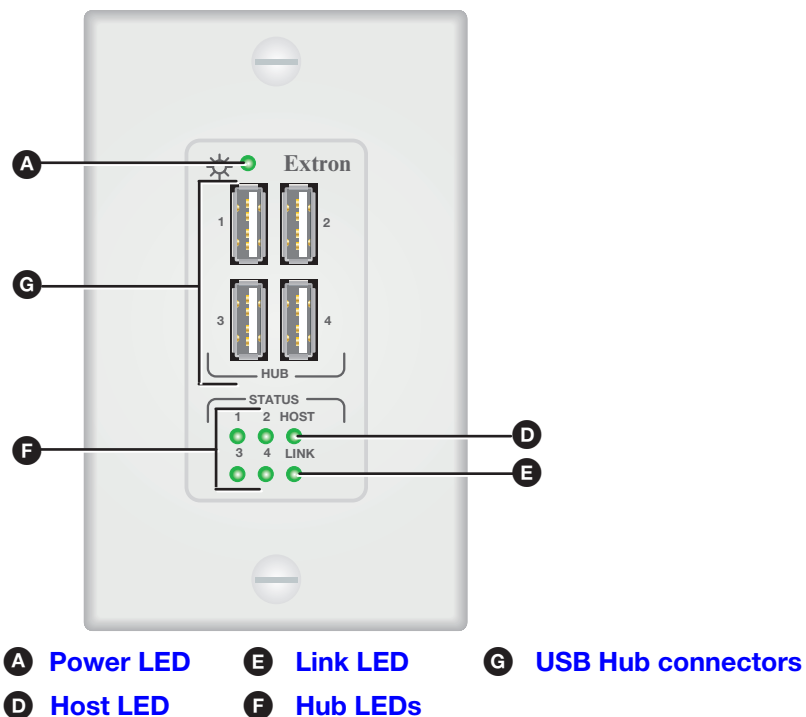


Figure 16. Receiver Front Panel, Decora Models

- A Power LED** — This green LED lights to indicate that the unit is receiving power.
- B Pair button** — This recessed button pairs the receiver with the transmitter, which must be done before operation the first time they are used together. Use a small screwdriver or stylus to press it (see [Pairing and Unpairing the Transmitter and Receiver](#) on page 12).
- C Config port** — (Rack-mountable models only) Connect a 9-pin D-to-2.5 mm TRS cable from a computer to this 2.5 mm TRS jack for RS-232 communication (see [Connecting for Serial Communication](#) on page 13). The Config port enables serial communication with the computer for configuration and control of the receiver via SIS commands (see [Remote Configuration and Control](#), beginning on page 20).
- D Host LED** — This green LED blinks when both the transmitter and receiver are powered, both are correctly connected by the twisted pair cable, and the receiver is communicating with the host PC.

Blinks when the transmitter and receiver are both powered and connected, but no USB devices are connected.
- E Link LED** — This green LED lights when the transmitter and receiver are successfully paired, connected together by the twisted pair cabling, and receiving power.

While the receiver is being paired with the transmitter, this LED blinks. When the pairing process is completed, the LED lights steadily.
- F Hub LEDs** — A single green LED for each port lights when the peripheral device connected to the associated USB port is recognized by the host PC.
- G USB Hub connectors** — The built-in four port hub has four female USB Type A connectors. The connections are USB 3.0 compatible, providing +5 VDC at up to 500 mA to connected USB peripherals requiring power.

System Operation

No drivers are required for a host PC to function with the USB Extender Plus T/R. The transmitter is detected by the operating system and appropriate USB drivers are loaded. Certain USB peripherals, such as gaming keyboards, USB interactive whiteboards, scanners, printers, and similar devices, require specific drivers installed on the PC. See the USB device installation instructions or the website of the peripheral device manufacturer to obtain drivers.

Once the transmitter, the receiver, the PC or USB host, and peripherals are connected, have appropriate drivers loaded, and are powered up, the system is fully operational. If problems are encountered, ensure all cables are routed and connected properly and the latest drivers for each peripheral are installed.

Troubleshooting

USB signals are generally reliable but are susceptible to bad connections or cables that are too long. The TP cable can have the same issues. To avoid the loss of data and communications, follow these guidelines:

- The USB cables that connect the transmitter to the host or the receiver hub ports to peripheral devices should not exceed 6 feet (1.8 meters).
- When connecting the host or peripherals, use only cable designed for USB signals.
- Avoid or limit the use of adapters.
- The USB Extender Plus works as described in point-to-point applications. Do not use additional adapters, patch panels, or couplers with the host USB cables, hub USB cables, or twisted pair cables. Additional links in the signal chain can result in the reduction of signal integrity and overall system performance.

When properly connected and operating, the transmitter and receiver Power LEDs, Link LEDs and Host LEDs are lit. The Hub LED for each connected peripheral recognized by the host PC is also lit.

Front panel LEDs are also useful for troubleshooting. Table 1 outlines operating details indicated by the LEDs.

	Transmitter		Receiver	
LED Indicator	On	Off	On	Off
Power	12 VDC power supply is connected and operating properly.	12 VDC power supply is not connected or is defective.	12 VDC power supply is connected and operating properly.	12 VDC power supply is not connected or defective.
Link	Both transmitter and receiver are paired, have power, and are connected properly by the TP cable.	If both Power LEDs are on, the TP cable is not connected or is improperly wired, or the units are not paired. If either Power LED is off, see the Power LED troubleshooting instructions, above.	Both transmitter and receiver are paired, have power, and are connected properly by the TP cable.	If both Power LEDs are on, the TP cable is not connected or is improperly wired, or the units are not paired. If either Power LED is off, see the Power LED troubleshooting instructions, above.
Host	When transmitter power LED is on, lights when communication with host PC is established.	If transmitter power LED is on, USB cable is not connected.	Lights when communication with host PC is established. Blinks if power and Link LEDs are on, but no USB devices are connected.	Host USB port is not connected or host is not communicating.
Hub	N/A	N/A	Lights when a connected peripheral is recognized by the host PC.	A peripheral device connected to the USB port has not been recognized or is improperly connected.

Table 1: System Troubleshooting

Remote Configuration and Control

This section describes the connection through which the USB Extender Plus can be configured and controlled remotely via Simple Instruction Set (SIS) commands, and describes the commands that are available. Topics include:

- [SIS Commands](#)
- [Using the Command and Response Table](#)
- [Command and Response Table for SIS Commands](#)

SIS Commands

Using SIS commands, you can remotely set up and control the USB Extenders Plus T/R via a host computer or other device (such as a control system) that is attached to the Config port or to the front panel Host port (AAP and Decora models only). You can issue SIS commands to the extender using a communication software program such as Extron DataViewer or HyperTerminal.

NOTE: The SIS command for resetting must be issued to both the transmitter and the receiver. Do not reset one unit without resetting the other.

SIS commands consist of one or more characters per field. No special characters are required to begin or end a command sequence. When the USB Extender Plus determines that a command that was entered is valid, it executes the command and sends a response to the host device.

Most responses from the USB Extender Plus T/R to the host computer end with a carriage return and a line feed (CR/LF = ) , which signals the end of the response character string. A string is one or more characters.

Extender-initiated Message

When power is applied to the extender, it sends the following copyright message:

© Copyright 20nn, Extron Electronics USB Extender Plus, Vn.nn 

where Vn.nn is the firmware version number.

NOTE: This message is displayed only when power is applied to the extender while it is connected to the computer via the Config port.

Error Responses

If the extender is unable to execute a command it receives because the command is invalid or contains invalid parameters, the USB Extender Plus T/R returns an error response to the host. The error response codes for USB Extender Plus T/R include:

- E10 — Invalid command
- E12 — Invalid port number
- E13 — Invalid parameter
- E14 — Not valid for this configuration
- E22 — Busy
- E24 — Privilege violation
- E25 — Device not present

Using the Command and Response Table

The **Command and Response Table** on page 23 lists valid ASCII command codes, the responses of the extender to the host, and descriptions of the command functions or the results of executing the commands.

ASCII to Hexadecimal Conversion

The ASCII to Hex Conversion Table below is for use with the Command and Response Table.

ASCII to HEX Conversion Table																Esc 1B	CR 0D	LF 0A
Space 20	!	21	"	22	#	23	\$	24	%	25	&	26	'	27				
(28	)	29	*	2A	+	2B	,	2C	-	2D	.	2E	/	2F				
0 30	1	31	2	32	3	33	4	34	5	35	6	36	7	37				
8 38	9	39	:	3A	;	3B	<	3C	=	3D	>	3E	?	3F				
@ 40	A	41	B	42	C	43	D	44	E	45	F	46	G	47				
H 48	I	49	J	4A	K	4B	L	4C	M	4D	N	4E	O	4F				
P 50	Q	51	R	52	S	53	T	54	U	55	V	56	W	57				
X 58	Y	59	Z	5A	[	5B	\	5C	]	5D	^	5E	_	5F				
` 60	a	61	b	62	c	63	d	64	e	65	f	66	g	67				
h 68	i	69	j	6A	k	6B	l	6C	m	6D	n	6E	o	6F				
p 70	q	71	r	72	s	73	t	74	u	75	v	76	w	77				
x 78	y	79	z	7A	{	7B		7C	}	7D	~	7E	DEL	7F				

Symbol Definitions

- ↵ = CR/LF (carriage return and line feed) (hex 0D 0A)
- ← or | = Soft carriage return (no line feed)
- = Space
- Esc or W = Escape key (hex 1B)
- X1 = On and off (enable and disable)
0 = Off or disabled
1 = On or enabled
- X2 = Extender unit part number:
Transmitter: 60-1471-12
Receiver: 60-1471-13
HID Only Transmitter: 60-1539-12
HID Only Receiver: 60-1539-13
AAP Transmitter, black: 60-1472-12
AAP Transmitter, white: 60-1472-13
AAP Receiver, black: 60-1472-22
AAP Receiver, white: 60-1472-23
Decora Transmitter: 60-1473-13
Decora Receiver: 60-1473-23

NOTE: Unless otherwise indicated, commands are **not** case sensitive.

Command and Response Table for SIS Commands

Command	ASCII Command (Host to Unit)	Response (Unit to Host)	Additional Description
Information Requests			
Request part number	N	[X2] ↵	Show the extender part number [X2] . For [X2] : Transmitter: 60 - 1471 - 12 Receiver: 60 - 1471 - 13 HID Only Transmitter: 60 - 1539 - 12 HID Only Receiver: 60 - 1539 - 13 AAP Transmitter, black: 60 - 1472 - 12 AAP Transmitter, white: 60 - 1472 - 13 AAP Receiver, black: 60 - 1472 - 22 AAP Receiver, white: 60 - 1472 - 23 Decora Transmitter: 60 - 1473 - 13 Decora Receiver: 60 - 1473 - 23
Query firmware version	Q	<i>n.nn</i> ↵	Show the firmware version, expressed to the second decimal place.
<i>Example:</i>	Q	1.01 ↵	The unit firmware version is 1.01.
Query firmware version and build	*Q	<i>n.nn.nnnn</i> ↵	Show firmware version and build number.
Peripheral Emulation (Transmitters Only)			
NOTE: These commands can be issued only to the transmitter.			
Set peripheral emulation	[Esc] E [X1] USBC ←	Usbc E [X1] ↵	Set peripheral emulation for the USB Extender Plus T/R to [X1] . For [X1] : 0 = disabled (default) 1 = enabled
View peripheral emulation	[Esc] E USBC ←	[X1] ↵	
Resetting			
NOTE: This command must be issued to both the transmitter and the receiver.			
Reset	[Esc] ZXXX ←	Zpx ↵	Reset the extender to factory default values while retaining pairing.
Upload Firmware			
Upload firmware	[Esc] UPLOAD ←	...go Up1 ↵	Up1 ↵ is displayed after the upload is complete.

Reference Information

This section provides information on the following subjects:

- **Twisted Pair Cable Termination**
- **Mounting the USB Extender Plus T/R**

Twisted Pair Cable Termination

NOTES:

- RJ-45 termination with CAT 5, CAT 5e, CAT 6, CAT 6e, and CAT 7 cable must comply with the TIA/EIA T568A or TIA/EIA T568B wiring standard for all connections.
- The transmitter and receiver pair work with unshielded twisted pair (UTP) or shielded twisted pair (STP) cables; but to ensure FCC Class A and CE compliance, STP cables are required.
- Terminate both ends of the cable identically, in accordance with either the **TIA/EIA T 568A** or the **TIA/EIA T 568B** wiring standard.

Figure 17 shows the recommended termination of TP cables with RJ-45 connectors.

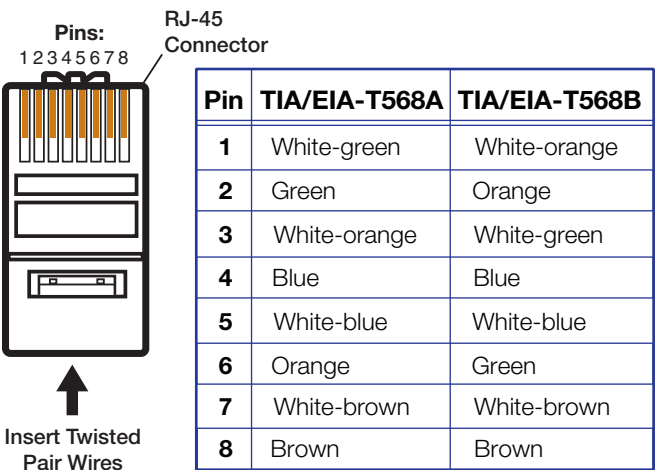


Figure 17. TP Cable Termination

NOTE: Do not use Extron UTP23SF-4 Enhanced Skew-Free™ AV UTP cable to link the transmitter and receiver. Skew-free AV cable is designed for Extron TP transmitter and receiver AV applications. The USB Extender Series does not work properly with this cable.

Mounting the USB Extender Plus T/R

USB Extender Plus T/R Standard and HID Only

The 6 inches (15 cm) deep, 1 inch (2.5 cm) high, quarter-rack wide USB Extender Plus T/R transmitter and receiver can be placed on a tabletop, mounted on a rack shelf, or mounted under a desk or tabletop. See the installation instructions provided with the individual mounting kits.

Tabletop Placement

Affix the four included rubber feet to the bottom of the unit and place it in any convenient location.

Rack Mounting Safety Guidelines

The following Underwriters Laboratories (UL) guidelines pertain to the safe installation of these products in a rack:

- 1. Elevated operating ambient temperature** — If the unit is installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient temperature. Therefore, install the equipment in an environment compatible with the maximum ambient temperature (T_{ma}: +122 °F, +50 °C) specified by Extron.
- 2. Reduced air flow** — Install the equipment in the rack so that the equipment gets adequate air flow for safe operation.
- 3. Mechanical loading** — Mount the equipment in the rack so that uneven mechanical loading does not create a hazardous condition.
- 4. Circuit overloading** — Connect the equipment to the supply circuit and consider the effect that circuit overloading might have on overcurrent protection and supply wiring. Consider the equipment nameplate ratings when addressing this concern.
- 5. Reliable earthing (grounding)** — Maintain reliable grounding of rack-mounted equipment. Pay particular attention to supply connections other than direct connections to the branch circuit (such as the use of power strips).

To find an appropriate rack mounting kit for your installation, go to the product page at www.extron.com.

Furniture Mounting

The USB Extender Plus can be mounted to a desk, podium, or other furniture as follows:

- **Under furniture** — The unit can be mounted under a horizontal surface using an optional Under-Desk Mount Kit for eighth-rack and quarter-rack width products (see www.extron.com).
- **Through furniture** — The transmitter or receiver can be mounted through a desk or other furniture using an optional Extron Through-Desk Mounting Kit for quarter-rack or half-rack width products (see www.extron.com).

USB Extenders Plus T/R AAP and D

You can install the USB Extender Plus AAP and Decora transmitter and receiver in an electrical junction box, attach them to AAP frames or mud rings, or both.

Wall mounting

Safety guidelines

The wall installation must conform to national and local electrical codes and to the wall plate size requirements. The following UL guidelines pertain to the installation of the wall mountable transmitters and receivers into a wall or furniture.

- Do not connect these units to a centralized DC power source or use beyond their rated voltage range.
- These units must be installed in UL listed junction boxes.
- These units must be installed with conduit in accordance with National Electrical Code.

Preparing the site and installing the junction box

If installing the extender in a junction box:

- Choose a location that allows cable runs without interference.
- Allow enough depth for both the wall box, the TP cable and power supply wiring. The box should be at least 2.5 inches (6.4 cm) deep to accommodate the connectors and cables.
- Run the TP and power supply wires into the wall, furniture, or conduits before installing the wall plate.

NOTE: The Decora series mounts in a standard single-gang wall box.

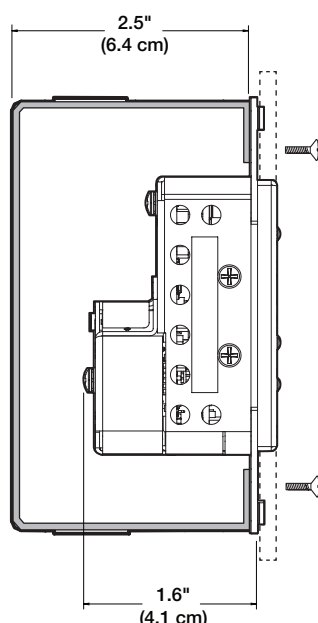


Figure 18. Wall Box Depth Profile, AAP and Decora

Final installation

To complete the installation:

1. Test the USB Extenders Plus for proper operation.
2. At the power outlet (not the extender), unplug the power supply.
3. Mount the transmitter or receiver into the wall box.
4. At the power outlet, reconnect the power supply.

AAP mounting

The USB Extender Plus T/R AAP transmitter and receiver can also be mounted to a two-space AAP frame, available at www.extron.com. Follow the instructions provided with the frame to attach the extenders to it.

Figure 19 shows an example of mounting both an AAP extender and a Decora extender to an AAP frame.

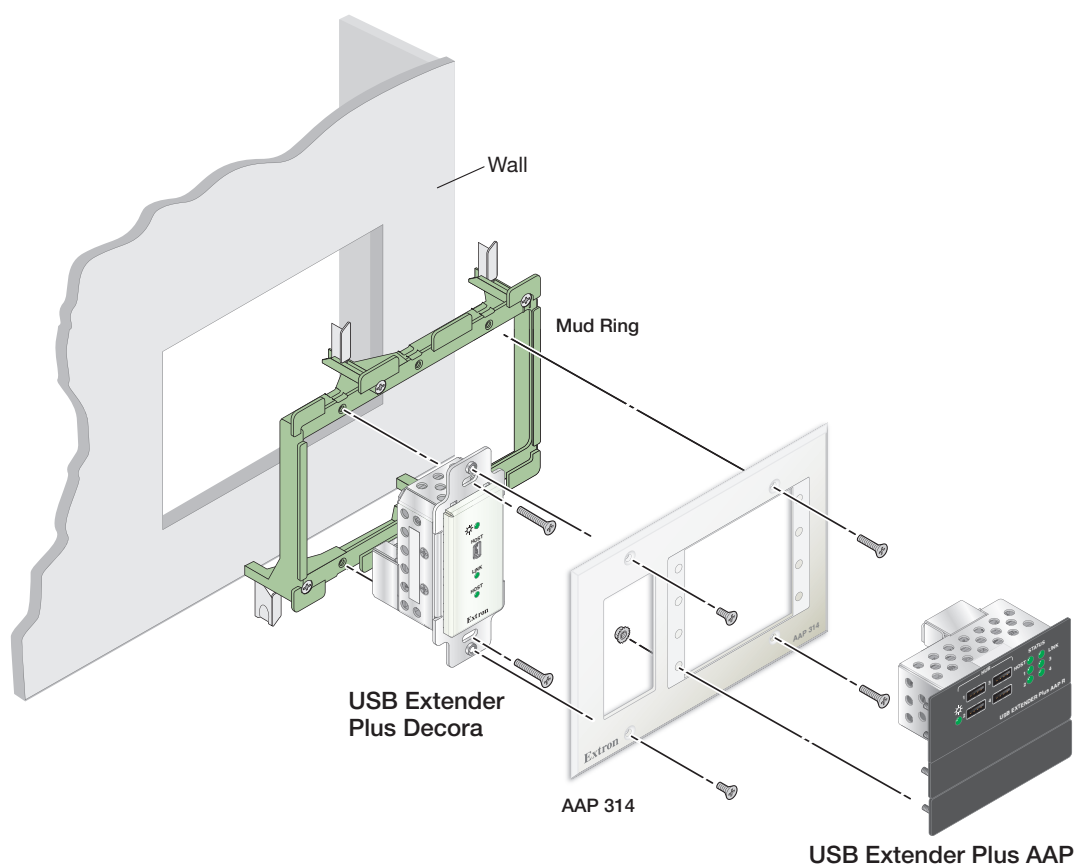


Figure 19. Mounting a USB Extender Plus T/R AAP and Decora to an AAP Frame and a Mud Ring

Extron Warranty

Extron Electronics warrants this product against defects in materials and workmanship for a period of three years from the date of purchase. In the event of malfunction during the warranty period attributable directly to faulty workmanship and/or materials, Extron Electronics will, at its option, repair or replace said products or components, to whatever extent it shall deem necessary to restore said product to proper operating condition, provided that it is returned within the warranty period, with proof of purchase and description of malfunction to:

**USA, Canada, South America,
and Central America:**

Extron Electronics
1230 South Lewis Street
Anaheim, CA 92805
U.S.A.

Japan:

Extron Electronics, Japan
Kyodo Building, 16 Ichibancho
Chiyoda-ku, Tokyo 102-0082
Japan

Europe and Africa:

Extron Europe
Hanzeboulevard 10
3825 PH Amersfoort
The Netherlands

China:

Extron China
686 Ronghua Road
Songjiang District
Shanghai 201611
China

Asia:

Extron Asia Pte Ltd
135 Joo Seng Road, #04-01
PM Industrial Bldg.
Singapore 368363
Singapore

Middle East:

Extron Middle East
Dubai Airport Free Zone
F13, PO Box 293666
United Arab Emirates, Dubai

This Limited Warranty does not apply if the fault has been caused by misuse, improper handling care, electrical or mechanical abuse, abnormal operating conditions, or if modifications were made to the product that were not authorized by Extron.

NOTE: If a product is defective, please call Extron and ask for an Application Engineer to receive an RA (Return Authorization) number. This will begin the repair process.

USA: 714.491.1500 or 800.633.9876
Asia: 65.6383.4400

Europe: 31.33.453.4040
Japan: 81.3.3511.7655

Units must be returned insured, with shipping charges prepaid. If not insured, you assume the risk of loss or damage during shipment. Returned units must include the serial number and a description of the problem, as well as the name of the person to contact in case there are any questions.

Extron Electronics makes no further warranties either expressed or implied with respect to the product and its quality, performance, merchantability, or fitness for any particular use. In no event will Extron Electronics be liable for direct, indirect, or consequential damages resulting from any defect in this product even if Extron Electronics has been advised of such damage.

Please note that laws vary from state to state and country to country, and that some provisions of this warranty may not apply to you.

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